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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/750,734	12/27/2000	Sanjay S. Natarajan	42390P10050	7194

8791 7590 07/03/2003

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EXAMINER

GURLEY, LYNNE ANN

ART UNIT PAPER NUMBER

2812

DATE MAILED: 07/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/750,734

Applicant(s)
Natarajan et al.

Examiner
Lynne Gurley

Art Unit
2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Apr 11, 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18, 20, 21, and 23-29 is/are pending in the application.
- 4a) Of the above, claim(s) 14-17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 18, 20, 21, and 23-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other:

Art Unit: 2812

DETAILED ACTION

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

The rejections under 35 USC 112 have been overcome by the amendment submitted 4/11/03.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Art Unit: 2812

3. The rejection of claims 1-2, 7, 18-20 and 24 under 35 U.S.C. 102(b) as being anticipated by Nulty et al. (US 5,468,342, dated 11/21/95) has been overcome by the amendment filed 4/11/03.

4. The rejection of claims 1-13 and 18, 20-21, and 23-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Andideh et al. (US 6,362,091, dated 3/26/02) has been maintained for the reasons of record.

a. Andideh shows the method as claimed in Figures 1a-2c and corresponding text, with substrate 100 with devices and an insulating layer (column 2, lines 55-67; column 3, lines 1-3); insulator 101 of silicon dioxide (also layers 103; 401,403,405,407,409 and 411; ie., column 3, lines 4-47; column 4, lines 3-15) and nitride or oxynitride etch stop 102 (also layers 104; 402,404,406,408,410, ie, column 3, lines 30-67; column 4, lines 16-30) which alternate in material and which may comprise the same or different materials even though they alternate in purpose. An interconnect via and trench is formed in the multilayered alternating structure 420/430, fig. 2c (ie, column 4, lines 30-40). Also, see column 4, description of figs. 2a-2c and column 5..

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

Art Unit: 2812

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459

(1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. The rejection of claims 3-6, 8-13, 21, 23 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nulty et al. (US 5,468,342, dated 11/21/1995) in view of Andideh et al

Art Unit: 2812

(US 6,362,091, dated 3/26/02) has been maintained for the reasons of record and extended to reject newly submitted claims 28-29.

Nulty shows the method as claimed in Figures 1, and 4-17 and corresponding text, with (as shown in Figure 12) nitride etch stop 1202, undoped TEOS oxide/BPSG composite layer 1201 (column 11, lines 38-57), hardmask nitride layer 1205 (column 6, lines 29-34) and resist photomask 1210. It is considered inherent that the method encompasses etching the oxide and nitride layers to the substrate or to contact the device layer, since the text discusses that different depths of contact holes are permitted; note that contact holes to the substrate are shown in the prior art of Figure 4. Also, see En et al. (US 6,399,480) for the contact hole made through the nitride etch stop layer to complete the contact to the substrate and to the device. (Column 5, lines 60-67; column 6, lines 1-3 and 60-67; column 9, lines 9-15; column 11, lines 50-57).

Nulty lacks anticipation only in not teaching that the dielectric layers are alternating material layers; that there are at least six alternating silicon dioxide layers; and that siliconoxynitride may be used for the etch stop.

Andideh teaches a method of forming a contact hole to a substrate layer using multiple layers of alternating dielectrics which are stacked upon each other according to the desired dielectric constant. These dielectrics may be oxides or nitrides or oxynitrides and low k layers and provide greater etch control because of their selectivity to each other as well as improved contact reliability and formation (Figures 1a-2c and corresponding text). Low k layers alternate with high k layers and various combinations may be achieved according to the desired dielectric constant.

Art Unit: 2812

Siliconoxynitride may be used for the etchstop layers and any number of layers may be used to complete the structure.

It would have been obvious to one of ordinary skill in the art to have substituted the dielectric layer in the method of Nulty with the alternating dielectric layers taught in Andideh and to have used either silicon nitride for the etch stop layers and to have used at least six layers of alternating dielectrics as taught in Andideh, with the motivation that Nulty acknowledges that the dielectric layer used in the method may be comprised of different and multiple layers in order to improve the etch profile of the contact hole, so, in light of this, it would be obvious to substitute the layers in Andideh into the method of Nulty for the same reason and further, in order to reduce the dielectric constant.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Art Unit: 2812

Response to Arguments

8. Applicant's arguments filed 4/11/03 have been fully considered but they are not persuasive. Andideh shows the method as claimed and as described in the preceding paragraphs. Nulty and Andideh show the method as claimed in combination.

In reference to Applicant's remarks, page 7, the term "directly over the substrate", in its broadest interpretation, is met by the references.

Prior art Of Record


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is strongly advised to review Ku et al. (US 6,383,918) which shows the steps of the claimed invention in figures 3-7; Islam et al. (US 6,174,810) which shows the method of the claimed invention in Figures 1-12. Also see En et al. (US 6,399,480) and Havemann (US 5,565,384) for the foundation and etch stop layer of the invention without the multiple dielectric layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is (703) 305-3474. The examiner can normally be reached on Monday-Friday from 7:30 AM to 6:00 PM.

Art Unit: 2812


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John F. Niebling, can be reached on (703) 308-3325. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



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June 30, 2003



John F. Niebling
Supervisory Patent Examiner
Technology Center 2800